2. Infrastructure needs assessment

SUMMARY

The role of the fishing port may be considered as the interface between the harvesting of a fish and its consumption; thus the type and size of a fisheries port and its infrastructure greatly influence the way and rate at which a country's living marine resources can be exploited. The perceived need for a fishing port, however, is likely to originate from a combination of fisheries management planning and pressure from the industry to meet local consumption needs and of the export market.

In order to plan and design a fishing port that is commensurate with the targeted resources (not too large, not too small, but just large enough), a fishing port planner needs the full cooperation of fisheries managers, hydrographers and those responsible for coastal area management, fishing industry leaders and fishing communities. In particular, the port planner would need to know and understand the resources that have to be exploited (low-value high-volume or high-value low-volume), the catch potential, including seasonal variations, the local or proposed marketing systems, including export potential and consumer preferences (fresh, frozen, salted, smoked or canned fish).

This chapter describes how to plan shore-based facilities and fishing ports that are commensurate with the targeted resources within the EEZ of the coastal State and distant water fisheries, as the case may be, that would be environmentally sustainable and financially justifiable. Attention is also drawn to the aquaculture/mariculture sector. The overall objective is to make the reader aware of the decision-making process following a needs assessment.

CONTENTS

2.1 SIZING A PORT AND ITS FACILITIES

2.1.1 General

The port planner should bear in mind that sometimes new fishing port facilities are designed primarily around a specified fishing vessel's characteristics and performance, as in the case of imported, highly sophisticated and modern trawlers, leading to very complex and expensive port designs; it might, however, be possible that a country's exploitation of its available marine resources would be better achieved by the proper management of existing, indigenous fleets requiring relatively cheaper port facilities.

In some cases, where the costs for the harbour works and associated infrastructure cannot be borne by the fishery industry alone, port facilities are shared with nearby commercial harbours. In order to plan and design a fishing port that is commensurate with the targeted resources, a fishing port planner, in conjunction with the competent authorities, must:

- understand the type of resources and the catch potential of the fish stocks that have to be exploited (the stocks could be seasonal or in danger of collapse if overfished);
- have access to, and advice regarding the latest and most accurate biological statistical data available (data of proven resources taken from actual landings by the existing fleet is preferable to data extrapolated from distant areas) and fisheries management forecasts; and
- obtain knowledge of the size, composition and performance of the existing fleet[1] and fisheries management development plans.

Failure to observe the above three conditions will inevitably result in a port facility that is either too large or too small. A port facility that is too large will either collapse financially or attract too many vessels to a specific area. If a port facility is too small, it too may collapse under the impact of a busy fleet. Ideally, a fishing harbour should be designed for a fleet which is just big enough to handle the current, proven and foreseeable marine resources.

Furthermore, the size of such a fleet and anticipated growth or decline should be specified beforehand by the appropriate authorities (department of fisheries) and not by the port planner.

From the above it follows that it is preferable to underdesign a facility by a shade or two (also known as precautionary design) rather than to overdesign a facility (reactive design): whereas a slightly underdesigned fishing port may put the visible infrastructure under strain, an overdesigned fishing port would put the relatively invisible resources under strain.

In the first case, the strain may be relieved by expanding the fishing port in a phased development process, provided of course that this possible need was foreseen at the design stage, whereas in the second case the effects may be very uncertain and the remedial solution may be impractical, costly or both.

Whether dealing with small motorized canoes or large fishing vessels, fisheries infrastructure generally consists of:

- a safe mooring area (the cheapest form is beaching, the most expensive a deep-water port);
- provision for utilities and boat servicing (water, fuel, workshops);
- fish handling infrastructure (ice, cold storage, sorting areas, processing facilities); and
- marketing infrastructure (local market, road to nearest city market or connection to a motorway or airport).

[1] Note that the reference to the existing fleet could include vessels used for mariculture activities. Appendix 2 provides an insight to the needs of that fisheries sector.

2.1.2 Types of fishing ports

There are obviously different types of fishery operations, each requiring different arrangements. As a result, it is difficult to arrive at clear-cut definitions that fully and consistently characterize port infrastructure. However, one solution is to grade ports according to the type of fishery they serve, i.e. artisanal, coastal, offshore and distant-waters.

Artisanal fisheries usually involve subsistence and artisanal fishermen operating on a daily trip basis a short distance from their village. Vessels typically consist of canoes (paddle, motorized or sail-powered) beached in front of the village (Figure 1).

FIGURE 1
Fully developed artisanal landing

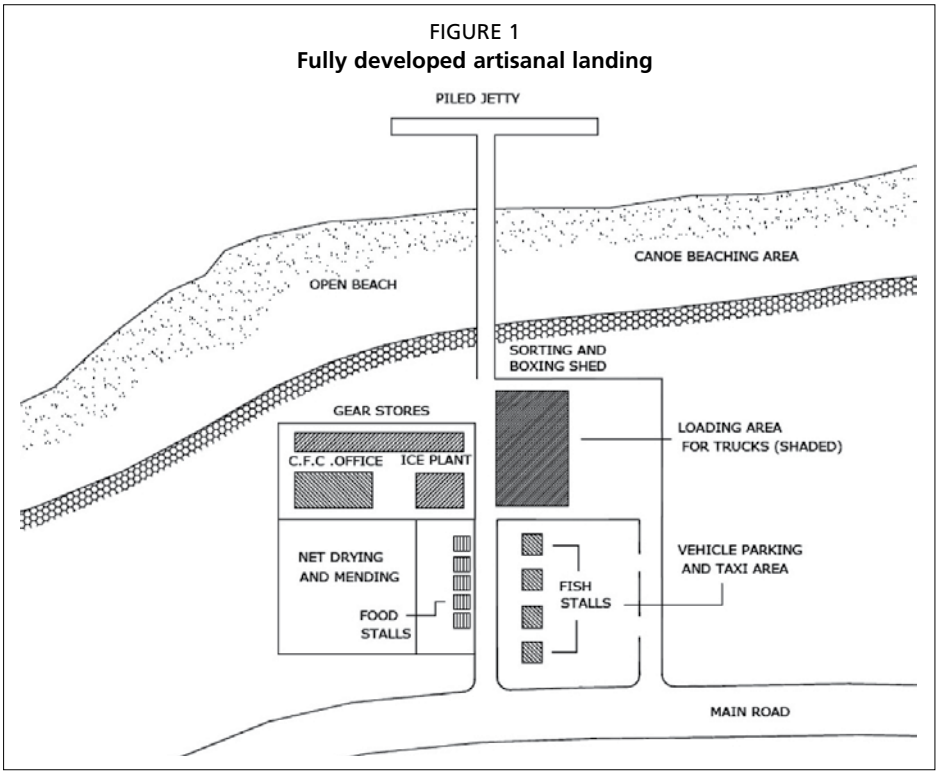


TABLE 1
Fully developed artisanal landing characteristics

Location of fishing grounds	Inshore, steaming distance up to 3 hours.
Typical fishing trip	Anywhere from 6 hours to 24 hours.
Type of vessels handled	Paddle canoes, motorized canoes and other small vessels. Fishing gear usually hand line, pole and line and set nets.
Type of landed products	A mixture of low-volume high-value and high-volume low-value. Paddle canoes high value only. Motorized canoes both.
Typical shore processing	High value – gutting, icing and boxing for onward sale. Low value – drying and smoking.
Minimum water depth required	No depth limitations as all vessels are beached for unloading.
Breakwater protection	In practice, a beach landing does not require protection. Breakwaters on beaches are reactive and unsustainable.
Auction – sorting hall	A sorting hall is required in all cases for icing and boxing. An auction hall is required if fish is auctioned locally as well.
Utilities	Mains power and water preferable. Gensets only suitable in some cases. Boreholes and seawater systems acceptable.
Ice production	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier.
Cold storage	Chilled storage on ice (3 °C) is acceptable even using insulated fish boxes. Otherwise fish should be moved to a proper cold storage.
Refuelling	Small-scale installation (up to 10 000 litres) is the most suitable.
Dry docking – slipways	Slipways are not normally required. Mechanically operated winches for the larger boats are enough.

Table 1, continued

Transport links	The success or failure of the landing depends on good, all-weather road access.
Workshops	Small engine and timber hull workshops required. May be located in village.
Net repair areas	Required in all cases. A minimum of 500 m^2 should be set aside. Area should drain surface water away.
Fishermen's/seamen's facilities	A fishermen's cooperative with full facilities is highly desirable to enable all stakeholders to participate in the fishing, marketing and procurement activities. Adequate number of toilets and canteen facilities should be included.
Open storage and parking	Enough area should be set aside for parking to enable better connection with markets.
Ancillary services	Some landings also offer sea bus transport to other coastal villages and if managed properly should be encouraged.
Hinterland	A resident fishing village community nearby is desirable.

Coastal fisheries usually involve artisanal fishermen operating on one to two day trips from home. Vessels typically consist of large motorized canoes and decked and undecked fishing vessels with a maximum length of about 20 metres. These vessels would either be beached or moored in calm spots, such as bays and coves. In some cases, a proper port may be needed if the landings are high volume (Figure 2).

FIGURE 2
Coastal fisheries harbour

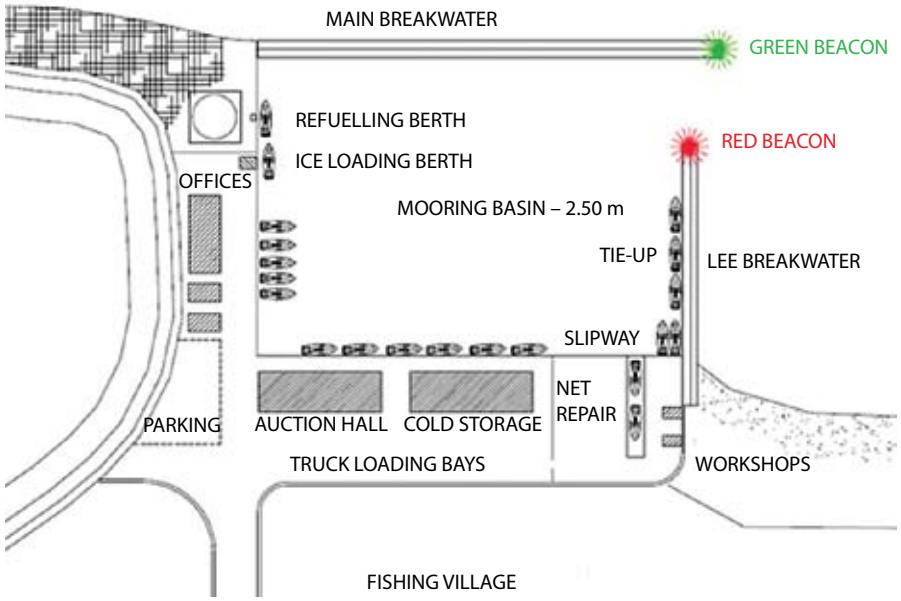


TABLE 2
Coastal fisheries harbour characteristics

Location of fishing grounds	Near coastal, steaming distance up to 6 hours.
Typical fishing trip	Anywhere from 1 to 3 days.
Type of vessels handled	Large motorized canoes and vessels up to 10 tonnes in weight. Fishing gear usually mini seine, pole and line, long line, trawl nets and gillnets.
Type of landed products	A mixture of low-volume high-value and high-volume low-value.
Typical shore processing	High value – gutting, icing and boxing for onward sale. Low value – drying and smoking.
Minimum water depth required	At least 2.50 metres below Lowest Astronomical Tide level.
Breakwater protection	Generally required unless port is inside a river estuary but breakwaters on beaches are reactive and unsustainable.
Auction – sorting hall	A sorting hall is required in all cases for icing and boxing. An auction hall is required if fish is auctioned locally as well.

Table 2, continued

Utilities	Mains power and water preferable. Gensets only suitable in some cases. Boreholes and seawater systems acceptable.
Ice production	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier.
Cold storage	Cold storage required. Chilled storage on ice (3 °C) is acceptable if fish is moved to a proper cold storage elsewhere.
Refuelling	Medium-sized installation (up to 100 tonnes in weight) is the most suitable. Bowser service also acceptable.
Dry docking – slipways	Slipway to handle vessels up to 100 tonnes in weight normally enough.
Transport links	The success or failure of the port depends on good, all weather road access. Road should already exist.
Workshops	Proper engine and timber hull workshops required in loco.
	Steel or GRP hulls may need extra workshop area.
Net repair areas	Required in all cases. A minimum of 1 000 m^2 should be set aside. Area should drain surface water away.
Fishermen's/seamen's facilities	A fishermen's cooperative with full facilities is highly desirable to enable all stakeholders to participate in the fishing, marketing and procurement activities. Adequate toilet and canteen facilities to be provided.
Open storage and parking	Enough area should be set aside for parking to enable better connection with markets and for dry boat storage in areas where monsoons are active.
Ancillary services	Port may also act as base for coastguard and fishery protection vessels.
Hinterland	A resident fishing village or town community nearby is desirable.

Offshore fisheries usually involve both fishermen and non-fisheries-related business interests who invest in vessel fleets. Fishing trips extend to the limit of the extended economic zone offshore and last anywhere up to four weeks. The vessel sizes are usually in the 20 to 40 metre range and the vessels generally need proper port facilities (Figure 3).

FIGURE 3
Offshore fisheries harbour

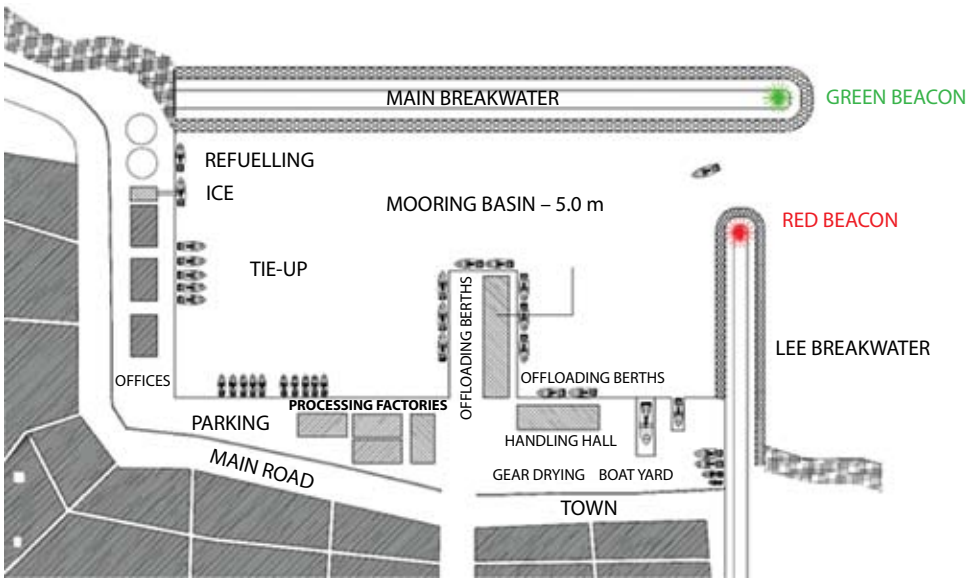


TABLE 3
Offshore fisheries harbour characteristics

Location of fishing grounds	Offshore and far coastal, steaming distance up to 1 week.
Typical fishing trip	Anywhere from 2 to 4 weeks.
Type of vessels handled	Large motorized canoes, purse seiners and trawlers. Vessels up to 100 tonnes in weight. Fishing gear purse seine and trawl nets.
Type of landed products	Mainly iced but also frozen pelagics, shrimps and other high-value species.
Typical shore processing	Canneries, fishmeal, salting, drying and smoking.
Minimum water depth required	At least 5.0 metres below Lowest Astronomical Tide level.
Breakwater protection	Generally required unless port is inside a river estuary but breakwaters on beaches are reactive and unsustainable.
Auction – sorting hall	A sorting hall and auction area is required in all cases.
Utilities	Mains power only and town supplied water. Boreholes and seawater systems acceptable in areas of low rainfall.
Ice production	Of primary importance. Should only be mains powered otherwise delivered from nearest supplier.
Cold storage	Cold storage required for buffer stocks. Chilled storage on ice (3 °C) is acceptable in some cases.
Refuelling	Large sized installation (up to 1 000 tonnes in weight) is the most suitable. Bowser service also acceptable in some cases.
Dry docking – slipways	Slipway to handle vessels up to 500 tonnes in weight normally required.
Transport links	The port is only feasible if road already exists.
Workshops	Proper engine and hull workshops required in loco. Steel or GRP hulls may need extra workshop area.
Net repair areas	Required in all cases. A minimum of 1 000 m^2 required. Area should drain surface water away and be part covered.
Fishermen's/seamen's facilities	A cooperative with full facilities (banking and wholesale supplies) is required. Full toilet and shower facilities as well as canteen services must be included.
Open storage and parking	Enough area should be set aside for parking and storage of seasonal fishing gear, as well as for dry boat storage in areas where monsoons are active.
Ancillary services	Port may also act as base for coastguard, SAR centre, oil spill combat and fishery protection vessels.
Hinterland	A town community nearby is desirable with full facilities, including hotels, hospitals, banking, shipping agents.

Distant-water fisheries involve large, modern, factory-type trawlers roaming the oceans on very long trips, 6 to 12 months at a time. Their home port can be located at specially provided facilities in commercial ports but are considered more effective when specifically designed for the industry within a properly established fishery port (Figure 4).

FIGURE 4
Distant-water fisheries harbour

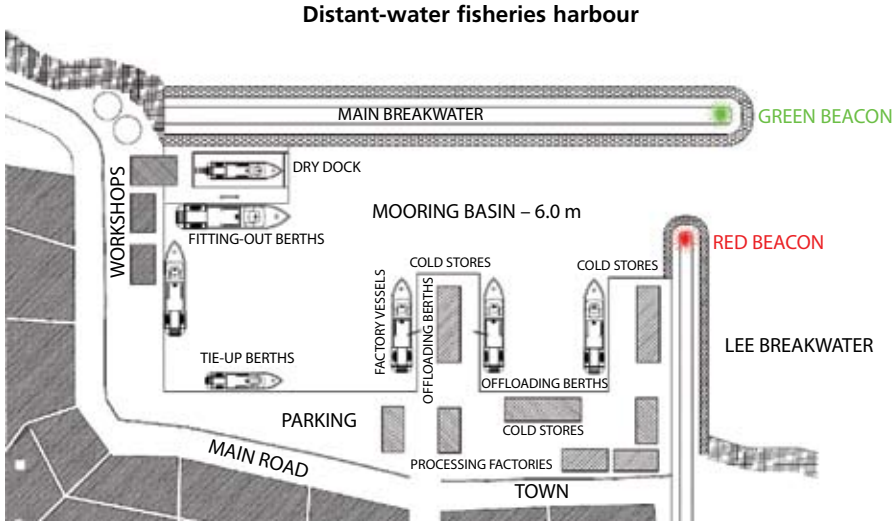


TABLE 4
Distant water fisheries harbour characteristics

Location of fishing grounds	Overseas, steaming distance up to 1 month.
Typical fishing trip	Anywhere from 6 to 12 months.
Type of vessels handled	Large trawlers (500–1 000 tonnes GRT) and factory vessels (5 000 tonnes GRT).
Type of landed products	Mainly frozen, in bulk, individually packed or ready processed for direct sale through commercial outlets.
Typical shore processing	Packaging, canneries, fishmeal and other value added processing.
Minimum water depth required	At least 6.0 metres below Lowest Astronomical Tide level.
Breakwater protection	Generally required unless port is inside a river estuary but breakwaters on beaches are reactive and unsustainable.
Auction – sorting hall	A sorting–auction area is not required in most cases.
Utilities	Mains power only and town supplied water. Boreholes and seawater systems acceptable in areas of low rainfall.
Ice production	Of secondary importance as products are all frozen.
Cold storage	Cold storage required for buffer stocks and local processing needs.
Refuelling	Large sized installation (in excess of 1 000 tonnes in weight) is generally required. Bowser service not suitable.
Dry docking – slipways	Common for vessels to dry dock at established yards, even overseas, hence not important.
Transport links	The port is dependent on road, rail and air transport links.
Workshops	Proper engine and hull workshops required.
	Steel or GRP hulls may need extra workshop area.
Net repair areas	Generally not required as nets are repaired elsewhere due to their size and complexity.
Fishermen's/seamen's facilities	A proper seamen's union with full facilities is required.
Open storage and parking	Enough area should be set aside for parking and storage of seasonal fishing gear.
Ancillary services	Port may also act as base for coastguard, SAR centre, oil spill combat and fishery protection vessels.
Hinterland	A town community nearby is required with full facilities, including hotels, hospitals, banking, shipping agents.

As a general rule:

- The size of the port is governed by the size of the fleet (as indicated by the competent fisheries authority) operating from the port and the type of vessels that make up the fleet.
- The size of the shore facilities then depends on the throughput of fish through the port and the amount of value-added processing proposed.

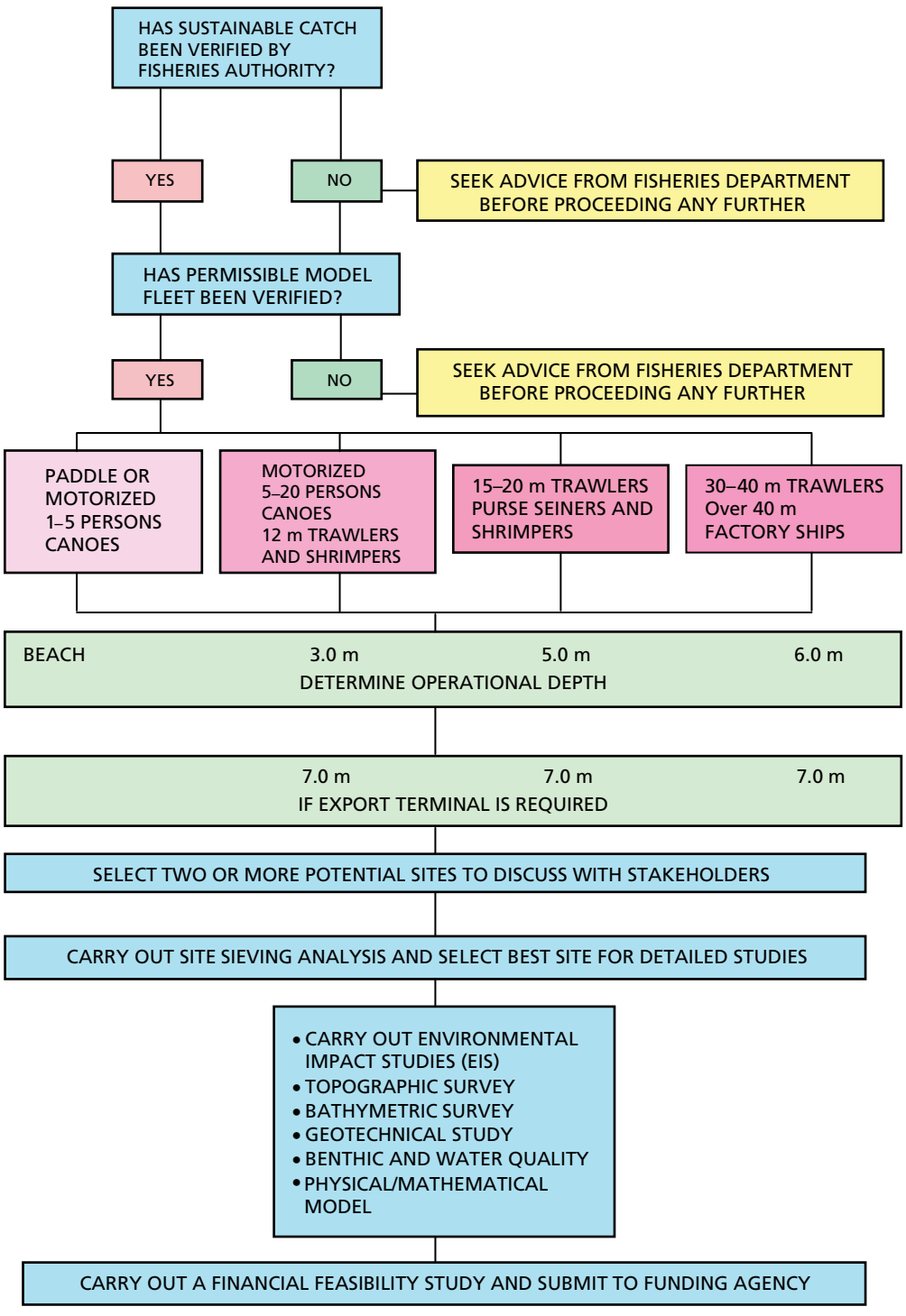
Figure 5 illustrates the flow chart of the design process for a typical fishing port all the way to financial feasibility.

2.1.3 Safe havens

Ports in areas where hurricanes and monsoons are common natural occurrences may need a safe haven or storm shelter inside the port basin or close by as an added safety measure for floating vessels. In some Asian countries, whole vessel fleets are placed ashore for the entire monsoon season and need a considerable level area for this purpose. In the Caribbean, every island has created safe havens (mainly on the leeward side).

However, the subject of safe havens has been given greater attention in recent years in relation to disaster preparedness programmes. Consequently, a port planner should be involved in the development of safe havens, particularly in relation to essential facilities and access.

FIGURE 5
Sizing a port – flow chart



2.2 SITE OF A FISHING PORT

2.2.1 Planning requirements

A new fishing port may be built on virgin land or installed in a rehabilitated existing port environment or even in an urban area. In all cases, the planning process must consider:

- the land use of the area proposed;
- the general environmental conditions of the site;
- the ease of access to the site;
- the availability of sanitary water; and
- existing and future industrial planning.

2.2.2 Land use

In general, when planning a fishing port, whether it be a small landing jetty on a beach or a large deep-water port, it is better to design a layout with arrangements flexible enough to permit adjustment at a future date, if the assumptions on which the needs assessment were based prove to be different to real life conditions. In other words, a fishing port and its land-based infrastructure should not be stuck in between fixed land boundaries (like schools, playgrounds, cemeteries, factory sites, housing, etc.) with no scope for expansion at a later date. Vice versa, if a new port is planned along a stretch of virgin coastline, a suitable buffer zone should be included around the port and land-use master plans should be strictly enforced to ensure that the buffer zone is not settled by illegal service settlements that generally crop up around such facilities in a matter of a short time.

In many cases, especially where there has been a low level of communication between agencies concerned with coastal area management and environment protection agencies, the incompatibility of heavy industries with the fisheries sector is not always questioned. As a result, fishing ports have been built next to or downwind from, *inter alia*:

- large power stations burning coal or heavy oil;
- cement manufacturing or bagging plants;
- wood or paper mills;
- fertilizer and petrochemical plants;
- chemical plants
- oil storage facilities;
- leather tanning facilities; and
- ore export terminals.

In some countries, fishing ports may also be located inside ports for merchant shipping; the reverse may also be true. In some cases, smoke-stack industries have been allowed a foothold inside urban areas that are too close to the fishing port. It is also known that these industries may have even started utilizing the fishing port for their needs. Such practices eventually lead to cross-contamination of the fish products through:

- settlement of particulate matter (dust) on fish and fish products;
- contamination of rainwater collection systems when these are required to supplement other supplies;
- fouling of harbour basin water when this may be required to alleviate the use of freshwater; and
- contamination of the groundwater aquifers themselves.

It is hence of the utmost importance to site fishing ports as far away as possible from such activities.

Clearly, when a new facility for fishing vessels is under consideration there is strong justification for close cooperation between ministries responsible for rural, industrial, urban and fisheries development issues. Such cooperation should extend to ease of access to environmental impact assessment (EIA) reports concerning planning permission for new industrial sites. For those carrying out an EIA they should also take all existing facilities into consideration (such as fishing vessel port facilities). Once a decision has been reached regarding the siting of a fishing port, legislation should be enacted to ensure that all future development in the area would not compromise the fishing port and its post-harvest facilities.

However, it is also incumbent on the fisheries department and the port planner to pay special attention to situations of incompatibility between an existing fishing vessel facility and industrial activities. In such cases where the quality of fish and fish products is adversely affected, a decision must be reached at local or national level as to what should be moved and to where or how such pollution could be regulated and how proposed solutions could be financed.

Unless this fundamental reasoning is accepted by all the parties involved, from local planners and engineers all the way up to local and national government, then unsolved problems of this nature are there to stay and will only lead to more existing fishing ports being condemned on pollution grounds; in effect, if the pollution is so bad, it may be that the industrial site has to be condemned for a multitude of reasons.

2.2.3 Accessibility

No matter what size of port is being planned, all-weather accessibility cannot be ignored or replaced with unpaved roads. Many developing countries tend to regard a good paved road as optional to the port structure due to the costs involved when the road should be part and parcel of the port.

Unpaved, or white or laterite roads, are very common in some developing countries, but in the presence of heavy rainfall these do not last more than one to two years before they require major maintenance.

2.2.4 Water

The rule of thumb where water is concerned is **No Water, No Port.** Water is required at every stage of the fishing process, both on board the vessels (for rinsing and hose-down), and ashore in the port (for rinsing, ice production and hose-down of work areas and hygiene). Whereas a town or mains supply is the preferred option, many fishing ports depend on bore wells. It is now also acceptable to replace up to 80 percent of the potable water needs with clean seawater if the port structures have been designed to resist seawater corrosion.

2.3 POST-CONFLICT RECONSTRUCTION PROCEDURES

Wars or conflicts may also leave a legacy of unexploded ordnance (UXO) contamination and it is therefore essential that this issue is tackled from the outset and at all stages of the project via internationally accepted guidelines on de-mining.

At sea, UXO may be the result of unexploded aerial bombs dropped on naval targets, sea mines or live ammunition dumped overboard in times of distress. In all cases, this may turn up in dredgers contracted out to dredge coastal areas in or near existing ports. As most of this UXO is metal based, a magnetometric survey should be commissioned in conjunction with the bathymetric survey and the position of all the positive "hits" by the magnetometer recorded and then inspected by experienced de-mining divers for presence of actual UXO.

On land, UXO may consist of unexploded aerial or artillery bombs, mortar shells and land mines. Although many areas in the world have been surveyed with a General Mine Action Assessment survey and/or a secondary Landmine Impact Survey, a

Dangerous Area Report, Mined Area Report, and/or a Landmine Impact Survey report for each Suspected Hazardous Area should be referred to before a project is undertaken in an area of known past conflict. This work must be done before the topographical and other land surveys are commissioned.

2.4 PROJECT JUSTIFICATION

Any harbour project, no matter what size, needs to be financially and technically justified if it is going to be planned, designed and managed in a sustainable manner in harmony with the surrounding environment.

Technically, the justification must be backed up with reliable data pertaining to:

- the fish stocks to be harvested (current biomass data and not mathematical extrapolations);
- the methods of fishing to be employed (environmentally sustainable);
- the technical feasibility of the proposed or chosen site (environmentally sustainable);
- the financial feasibility of the entire project (including port, services, access roads); and
- fisheries management programmes concerning fleet development.[2]

Projects with a large social component may not be self-sustaining, but when other social factors are included, such as the supply of safe drinking water, sewerage, lighting, roads, etc., some attempt must be made to monetize the project's contribution to the well-being of the community as a whole.

2.5 OVERCAPACITY IN EXISTING FISHING PORTS

2.5.1 Alternative uses

In many parts of the world, overcapacity in fishing vessels has to be faced by fisheries managers to limit effort within the maximum sustainable yield (MSY) and in many cases the solution has been to reduce the size of the fleet that is allowed to fish. Such a situation can lead to hardship for those associated with the vessels having to be decommissioned (but not necessarily sold or scrapped). This can be particularly traumatic where the fishing port may also be the hub of village life and cannot be simply dismantled.

2.5.2 Port income diversification

The possibilities to keep a fishing port operational and to offer alternative employment to fishing vessel crews is to re-engineer the port into a multioperation facility that does not rely solely on its dwindling fishing fleet but rather by hosting a number of marine-related activities. These activities could include:

- marine transport, ferries, etc.;
- diving tourism;
- eco-fishing tourism;
- support to offshore fish farming;
- coastguard and search and rescue (SAR) activities; and
- offshore industries (oil, gas and minerals).

[2] The reader is reminded that internationally agreed standards for the design, construction and equipment of fishing vessels, a combined effort between FAO, ILO: International Labour Organization, and IMO could influence management decisions as and when the provisions of the pertinent instruments are introduced as regulations in the Fisheries and or the Shipping Act.

2.5.3 Vessel income diversification

In some parts of the world, the need to drastically reduce fishing capacity has led to hardship within the industry with many vessels having to be decommissioned and the crews having to look for alternative employment. In extreme cases it led to death of fishing villages and the migration of the inhabitants to other areas.

However, the re-employment possibilities become limited in cases where there is no requirement for the training and certification of fishing vessel crews and the most probable areas to be under the greatest pressure is the small-scale fisheries sector.

This approach suggested under 2.5.2 above has been taken in a number of cases where the number of active fishing vessels had decreased, although in extreme cases it had not been found to be the complete solution. Appendix 1 to this chapter highlights the need to address the relevant national regulations when a change in a sea-going activity is under consideration.

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APPENDIX 1: CONVERSION OF COMMERCIAL FISHING VESSELS TO OTHER ACTIVITIES

Introduction

It is not uncommon to come across fishing ports with laid-up vessels that are unprofitable to operate or threatened with decommissioning by governments. With the current trend towards overfishing, this scene may become more common unless sound fisheries management practices are followed.

However, forcibly removing vessels from an active fishing fleet over a short period of time is perhaps the most traumatic way of reducing fishing capacity, particularly where the fishing port may also be the hub of village life and cannot be simply dismantled. In such cases, the first priority should be to look at alternative fisheries management systems and alternative opportunities for fishing boat owners and crew in the event that fleet reduction cannot be avoided.

Another aspect of fleet reduction would be the impact on the economy of a port due to reduced income leading to the need to explore other possibilities such as opening the port to non-fishing vessel potential users. This would imply, of course, further investment to re-engineer it into a multioperation facility to host a number of marine-related activities. These activities could include, *inter alia*:

- marine transport, ferries, etc.
- diving tourism;
- eco-fishing tourism;
- support to offshore fish farming;
- coast guard and SAR activities; and
- offshore industries (oil, gas and minerals).

In this appendix, income diversification opportunities for fishing vessel owners and their crews, in the event of a downturn in commercial fishing activities, are discussed that may have less impact on the social fabric of a local fishing community, especially in countries where historic rights exist and vessels are handed down from father to son.

It should be understood, however, that careful consideration must be given by fishing vessel owners forced to move out of commercial fishing, or by choice, into alternative vessel activities. For example, owners would be required to apply to the appropriate ministry for permission to engage in the new activity and, if approved, to apply to register the vessel accordingly. In some cases this may seem a simple process but in general there are a number of issues to address. For example, refitting work has to meet criteria under the relevant act in relation to, *inter alia*:

- the carriage of passengers;
- additional safety equipment;
- certificate of competence of those in charge of the vessel;
- mandatory insurance coverage for third party liability; and
- compliance with MARPOL Annex V if to be certified for 15 or more persons on board.

The carriage of passengers requires that the vessel has adequate accommodation and toilet facilities and the safety equipment would certainly have to be upgraded.

It should also be kept in mind that in many countries the law may not require the skippers of small fishing vessels to have a certificate of competency, but this might not be the case for other activities and the skipper (and others depending on the size of the vessel) would have to "go back to school" or otherwise be examined.

If all goes well it is likely that the vessel would lose its classification as a fishing vessel requiring it to be registered under the appropriate section of the relevant act for which the owner would have to supply documents attesting to:

- confirmation that it would be given licence to engage in sport fishing/diving/ecotourism/passenger carrying;
- compliance with the provisions of the national regulations governing the design, construction and equipment, including safety equipment, of a sport fishing/diving/ecotourism/passenger carrying vessel;
- approval of the provisions for manning;[3]
- the status of the ownership/manager in compliance with national legislation;
- evidence of the bill of sale;
- the carving note;
- confirmation that the refit had been supervised by the appropriate authority;
- the existence of a seaworthiness certificate as a sport fishing/diving/ecotourism/passenger carrying vessel; and
- mortgages and liens.

Thereafter, if all is well and where the authorization to engage in sport fishing/diving, ecotourism or passenger carrying was conditional on the vessel being registered, the one thing remaining would be proof of adequate insurance coverage.

Converting to other activities

Transport of passengers or cargo, diving and eco-fishing tourism activities could have the capacity to absorb some of the excess fleet capacity without destroying the livelihood of the fishermen and this can be obtained through vessel conversions, retooling and retraining. Note, however, that there would be no guarantee that the vessel would be allowed to reconvert to a commercial fishing vessel.

Conversion to mammal spotting and inter-island cruising

Essentially these activities would fall under regulations for the carriage of passengers and these would undoubtedly differ from region to region. Nevertheless, these regulations are unlikely to fall under the fisheries act. For this reason, conversion to the role of passenger carrying would mean that the vessel would no longer be a commercial fishing vessel. Consequently, the existing entry in the register of vessels would have to be closed and the converted vessel registered anew. In addition, it is likely that the following would have to be addressed:

- certificate of competence of the skipper and crew;
- safety equipment;
- accommodation and toilet facilities;
- authority to carry passengers;
- compliance with the collision regulations; and
- compliance with the provisions of Annex V of MARPOL (particularly if certified to carry 15 or more persons).

Conversion to sport fishing

Whereas the authorization to fish (where, when, how, species allowed and quotas) would normally fall under the Fisheries Act, the regulations covering the vessel and crew might fall under a different act. Furthermore, since the objective would be to carry "fee paying" sport fishers, it is likely that the vessel would fall under the regulations concerning the carriage of passengers and as such the conditions set out above would have to be met.

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[3] Note that the manning requirement for a sport fishing vessel, dive vessel and ecotourism vessel would be related to the safety of numbers of "sport fishermen"/"divers"/"tourists" that the vessel is so authorized to carry. The manning for a dive boat includes members of the crew specialized in diving techniques and technology.

Since the vessel would have to be classified as a sport fishing vessel, it would cease to be a commercial fishing vessel and this would have to be reflected in the process for the register of fishing vessels or ships as the case may be.

Conversion to a dive boat

Dive boats fall into two basic categories:

(i) commercial fish harvesting; and
(ii) non-fishing activities.

The first category falls under the Fisheries Act and would be subject to regulations concerning the design, construction and equipment for dive boats and compliance with fisheries management.

To convert a fishing vessel to a commercial fishing dive boat means addressing:

- the design, construction and equipment standards set out for such vessels;
- meeting the operational regulations related to qualifications for the skipper, crew and divers; and
- compliance with the collision regulations.

However, a dive boat for non-fisheries activities is unlikely to fall under the Fisheries Act in relation to its design and construction.[4] The actual conversion may be relatively simple but the manning of the vessel and specialized equipment needs to be addressed.

Therefore, provided that a typical small trawler, for example, with wheelhouse forward and fish hold aft has a clean bill of health as a fishing vessel, it could be readily converted to a dive boat provided special attention is given to the operational safety and facilities. In this regard, it is essential that the person in the wheel house has a clear uninterrupted view of the working deck and that the diving ladder has to be so arranged that the diver would be protected from the propeller. Toilets and changing accommodation would also have to be supplied, as divers might be a combination of male and female.

All safety equipment would have to be upgraded on the basis of the number of persons that the vessel would be authorized to carry, bearing in mind that the fee paying divers would be classified as passengers.

It should also be noted that the certificates of competence held by the serving skipper and crew (when it was a fishing vessel) may not be compatible with the regulations covering dive boats which would mean retraining (and examination) or replacing with suitably qualified persons. In addition, the expert diver in the crew must be suitably qualified and the whole crew, including the skipper, should undergo appropriate training before taking on board fee diver/passengers.

[4] The Fisheries Act may have to be addressed if the intention is to carry out sport fishing activities.

APPENDIX 2: SERVICING MARICULTURE FACILITIES

Introduction

Engineering solutions, such as for fish cages or suspended shellfish growout systems, have had to be developed by aquaculturists themselves. They have benefited, however, from the accumulated knowledge of seafarers in general and fishermen in particular in the design and operation of mooring and buoyage systems. More recently, when fish farmers have turned their attention to how to operate fish cages in locations further offshore where seas are rougher, the experience of the oil exploration industry has proven very valuable.

However, although most fish farming activities usually take place well away from a port or harbour facility, that sector is serviced by different types of seagoing craft that, in turn, require servicing. In addition, the sector also need, land space to prepare cages and pens for launching that might require cranes and close proximity to a fishing port or harbour facility is often preferred, particularly where offshore fish farming is practiced. Thus, during a harbour planning exercise the mariculture sector should not be ignored and indeed special attention should be given to the extent of development within the sector foreseen by fisheries managers.

Nevertheless, there are instances when a hatchery might actually be placed within the confines of a harbour facility, as shown in Figure 1, thus calling for space, access, clean (fresh/sea) water supplies and drainage systems.

FIGURE 1
Hatchery operation located within a harbour facility

Vessel servicing

The servicing of work boats in support of fish farming run parallel to the capture fisheries sector, with vessels varying in size from a sturdy canoe to relatively sophisticated vessels capable of towing large heavy sections and fitted with specialized deck equipment and, in some cases, diver support capability.

Particular attention must be given to hull cleaning, paint quality and the avoidance of the use of tributyltin-based antifouling compounds.

Land space

Cages vary in design from completely spherical shape up to more than 30 metres in diameter, to the more common tubular or cylindrical shape that may commonly vary in diameter from 20 metres to over 300 metres[5], as well as square or oblong cages. All types, however, require reasonably large areas of flat ground for their construction and the need for ready access to the sea.

Marking the position of cages in the sea

Cages and fish pens are a navigational hazard; consequently, they must be marked for their position in the sea by lights and shapes approved by the appropriate authority (Figure 2).

When an aquaculture farm is considered to represent a danger to navigation, it should be marked in accordance with the International Associations of Marine Aids to Navigation and Lighthouse Authorities (IALA) Maritime Buoyage System, using special marks, lateral or cardinal marks, or a combination thereof. The use of electronic aids to navigation such as racons or the Automatic Identification System (AIS) may also be considered. The farm (or group of farms) should be marked depending on their size, extent and location. In some cases, it may be sufficient to mark only part of the perimeter or the centre.

The harbour engineers should bear in mind that the following marking recommendations may be adjusted considering traffic density, proximity to ports, proximity to dangers, tidal considerations and other factors:

- Aquaculture farms are normally marked by special marks.
- If there is a requirement for vessel traffic between aquaculture farms, then such a channel should normally be marked with lateral marks.
- If the prevailing situation warrants it, cardinal marking alone may be used to direct mariners away from the aquaculture farm.
- To improve the effectiveness of the lighting, and taking into consideration background lighting, synchronization of the various lights should be considered.
- To improve the radar target and the visibility of the aquaculture farm, radar reflectors and reflective material should be considered.

Furthermore, charts need updating and notices to mariners issued from time to time. There is also a need to follow technology development in this sector such as self-propelled cages that requires the attention of harbour masters, national hydrographers, fisheries management and may require amendments to appropriate legislation.

FIGURE 2
Marking offshore fish cages

[5] The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) lighting and marking requirements cater for radii up to 2 000 metres.